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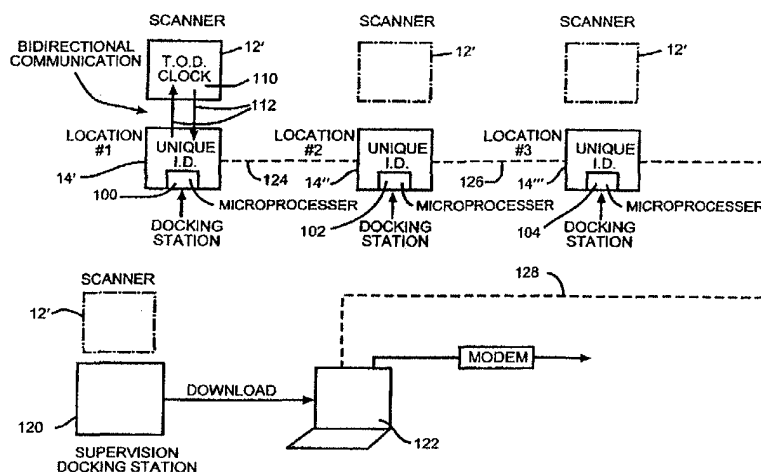
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(54) Title: MOBILE FINGERPRINT SCANNER AND DOCKING STATION



(57) Abstract: A system (10) including a mobile fingerprint scanner (12) and one or more docking stations (14) adapted to operatively receive the scanner. The scanner can be hand carried to various locations for obtaining fingerprint images and other information such as images from barcode scanning. The scanner is operated by a rechargeable battery and has the capacity of obtaining and storing a number of such images. The docking station includes a receptacle form for receiving the scanner whose stored images are downloaded via connection to a personal computer or the like, performs various diagnostic operations on the scanner before being withdrawn from the docking station for further use. The scanner can be used by law enforcement personnel at locations remote from the vehicle, and is carried by the security officer. The docking station is located at the location where the officer is to perform an inspection.

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MOBILE FINGERPRINT SCANNER AND DOCKING STATIONCross-Reference To A Related Application

5 Applicants hereby claim priority based on  
Provisional Application No. 60/153,182 filed on  
September 10, 1999 and entitled "Mobile Fingerprint  
Scanner And Docking Station" which is incorporated  
hereby by reference.

10

Background of the Invention

15 Inkless fingerprint scanners, also known as live  
scan fingerprint readers or biometric devices, have been  
widely used for many years. These systems obtain an  
image of the fingerprint without the use of inks. Once  
an image is acquired, it is then processed and an  
identification or verification of the individual's  
identity is made.

20 Many different techniques have been used to obtain  
an image of the finger including optical scanners,  
thermal scanners, capacitive scanners, E-field sensors,  
ultrasonic scanners, and many more. Each uses a  
different modality or technique to image the same  
25 physical characteristic; the ridge structure of the  
finger.

In use of such scanners in law enforcement and  
other applications it would be highly desirable to  
provide a mobile or portable scanner which can be hand  
30 carried easily for convenient use at various physical  
locations. It would also be highly desirable to provide  
the capability of interfacing with such a scanner at one  
or more physical locations for such operations as  
downloading fingerprint images and other information

stored in the scanner, scanner battery charging and scanner diagnosis.

5

### Summary of the Invention

The present invention provides a system including a mobile or portable fingerprint scanner and one or more docking stations adapted to operatively receive the scanner. The scanner can be hand carried to various locations for obtaining fingerprint images and other information such as images from bar code scanning. The scanner is battery operated and has the capacity of storing a number of such images. The docking station is in the form of a receptacle into which the scanner is inserted after obtaining one or more images. While the scanner is operatively received in the docking station, the image(s) stored in the scanner are download via a connection to a personal computer or the like, the scanner battery is recharged and the docking station performs various diagnostic operations on the scanner before it is withdrawn from the docking station for further use. In a typical law enforcement situation, the docking station is located within the law enforcement vehicle and the scanner can be used by law enforcement personnel at locations remote from the vehicle. In a typical security situation, a single scanner is carried by the security officer and a docking station is located at each checkpoint or location where the officer is to perform an inspection. Each bay station has a unique identification and there is bi-directional exchange of information between the scanner and the bay station so that the identity of the security

officer can be confirmed and a record of the inspections is made which can be monitored at any time.

The foregoing and additional advantages and characterizing features of the present invention will  
5 become clearly apparent upon a reading of the ensuing detailed description together with the included drawing. The following detailed description of the invention, when read in conjunction with the accompanying drawings, is in such full, clear, concise and exact terms as to  
10 enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention.

#### Brief Description Of The Drawing Figures

15

Fig. 1 is a diagrammatic view of the mobile fingerprint scanner and docking station according to the present invention;

Fig. 2 is a schematic diagram further illustrating  
20 the mobile fingerprint scanner and docking station according to the present invention; and

Fig. 3 is a schematic diagram illustrating application of the mobile fingerprint scanner and docking station of the present invention in a security  
25 system.

#### Detailed Description Of The Illustrated Embodiments

Referring first to Figs. 1 and 2 there is shown and  
30 described a system 10 according to the present invention including a mobile or portable fingerprint scanner 12 and a docking station 14 adapted to operatively receive the scanner. The scanner 12 can be hand carried to various locations for obtaining fingerprint images and

other information such as images from bar code scanning. The scanner 12 is battery operated and has the capability of storing a number of such images. The scanner 12 can be of various types including, but not  
5 limited to, ultrasonic, optical, capacitance, E-field and thermal/infrared. By way of example, the mobile scanner 12 can be an ultrasonic scanner of the type shown in United States Patent No. 5,647,364 issued July 15, 1997, the disclosure of which is hereby incorporated  
10 by reference. Referring to Fig. 10 of that patent, memory 252 would have the capability of storing several fingerprint images and bar codes which will be described. In addition, the scanner of that patent would be adapted for battery operation. In a typical  
15 law enforcement situation, the scanner is carried by the law enforcement officer, such as in a pouch on his belt, to wherever the subject(s) to be fingerprinted is located. The officer can set the scanner on a suitable supporting surface, such as the hood of an automobile,  
20 and then use the scanner to take as many fingerprint images as needed. The subject's finger is placed on the image area 16 and the fingerprint is scanned to develop an image thereof as explained in the above-referenced Patent No. 5,647,364. The images are stored in the  
25 scanner 12 for later retrieval. A magnetic base 18 on the scanner facilitates temporary securement of the scanner on the vehicle body during use. The scanner 12 can be provided with bar code scanning capability via a bar code scanner 20 on the end of housing 22 so that  
30 when the officer takes a fingerprint image of a subject he also can scan the bar code information on the subject's vehicle registration and/or vehicle operator's license. LED indicators 24, 26 and 28 are provided to signal various scanner conditions as will be described.

An on-off switch 30 controls supply of power to the scanner and hence its operation. Scanner 12 is provided with battery recharging posts 32, 34 on one end of housing 22 which mate with contacts at docking station 14 for recharging the scanner battery in a manner which will be described. Scanner 12 also is provided with an infrared data link 36 for wireless transmission of fingerprint images while stored in docking station 14 as will be described.

The docking station 14 is in the form of a receptacle into which the scanner is inserted after obtaining one or more images. As shown in Fig. 1, the docking station is generally hollow rectangular in shape, open at one end, and having an interior region 40 shaped and sized to receive the scanner in a snug but removable manner. While the scanner is operatively received in the docking station 14, the image(s) stored in the scanner are downloaded via a connection to a personal computer or the like, the scanner battery is recharged and the docking station performs various diagnostic operations on the scanner before it is withdrawn from the docking station for further use. In a typical law enforcement situation, the docking station 14 is located within the law enforcement vehicle, being mounted to the floor or inside wall of the vehicle, such as by the brackets 42, 44 or the like and the scanner 12 can be used by law enforcement personnel at locations remote from the vehicle as previously described. When the law enforcement officer returns to the vehicle, he inserts the scanner 12 in the docking station 14. The scanner 12 is retained within the docking station by a magnetic latch or other suitable means (not shown). The docking station 14 is connected to a source of 12 volts d.c. in the vehicle, such as to the vehicle battery by

appropriate connection or through the cigarette lighter receptacle. The docking station 14 also is connected to the personal computer commonly provided in law enforcement vehicles, via the USB connection 46 indicated in Fig. 1. Docking station 14 also is provided with LED status indicators 50, 52 and 54. While the scanner 12 is in the docking station 14, the images stored therein are downloaded to the onboard PC for processing. The scanner battery is recharged while in the docking station 14. The two battery charging posts 32, 34 shown in Fig. 1 on one end of the scanner 12 mate with corresponding contacts in the docking station 14 to connect the 12V vehicle supply to the scanner battery. Also, each time the scanner 12 is stored in the docking station 14, a diagnostic routine is run on the scanner. If a problem is detected, the next time the scanner 12 is removed from the docking station 14 the scanner automatically is disabled and the appropriate LED status indicator is operated.

20

Table 1 sets forth additional features of scanner 12 and docking station 14, and Table 2 sets forth various advantages of the same.

25

## Table 1

## Scanner

- Image Size - 0.75"w x 1.0"l
- Stores up to 8 complete fingerprint images
- LED Indicators:
  - 30 Green - scanner ready to acquire image
  - Amber - flashes the number of fingerprint images stored internally
  - Red - low battery indicator
- Resolution - 500 dpi, 256 levels of grey

- Infrared wireless communication link downloads images to docking station
- Standard 9 volt rechargeable battery provides several hours of operation
- 5 • Size: 5.75"l x 3.25"w x 2.0"h
- Weight 2.1 lbs

#### Docking Station

- 12 volt DC operation
- 10 • Interfaces to Mobile Data Terminal via USB port
- LED indicators
  - Green - power on
  - Amber - transferring data to MDT
  - 15 Red - scanner batter recharging
- Built-in 9 volt battery charger
- Floor or side wall mount options
- Complete Software device drivers provided as a DLL for Win 95/98 and NT
- 20 • Size: 9"l x 3.8"w x 2.6"d
- Weight 1.7 lbs

#### General

- UL 1950, CSA No. 950-22.2, and FCC approvals
- 25 • Reliability - vibration tested to 9.5Gs, 20-2000Hz, random sinusoidal
- Operating Temperature - 140°F (max)
- Storage Temperature - 158°F (max)

30

#### Table 2

- Proprietary ultrasonic technology unaffected by most contamination found on fingers or platen

- Stores up to 8 individual fingerprints for transferring to Mobile Data Terminal
- Operation unaffected by ambient light or glare
- Self-test scanner diagnostics automatically
- 5 activated upon removal from the docking station
- Images automatically deleted upon successful transfer to docking station
- Magnetic base easily attached to vehicle
- 10 • Durable scratch resistant platen
- Rugged construction designed to withstand the harshest of environments
- Stores in pouch for easy mounting on the law enforcement officer's belt
- 15 • Securely locks into docking station
- Vehicle docking station installs easily using floor or side mount bracket

The foregoing is illustrated further in Fig. 2.

20 The bidirectional arrow 40 represents the path along which scanner 12 is inserted into and withdrawn from interior region 40 of docking station 14. Contacts 62 and 64 within scanner 14 are connected to a battery 66 or other appropriate voltage source for recharging the

25 battery within scanner 12 when scanner contacts 32, 34 mate with docking station contacts 62 and 64. A personal computer 70, i.e., the onboard PC previously mentioned, is connected via cable 72 to the USB connection 46 on docking station 14 for downloading the

30 fingerprint images stored in scanner 12 for processing by computer 70. Another connection via cable 76 between computer 70 and station 14 is shown in Fig. 2 for the purpose of performing the diagnostic routines on scanner 12 as previously described. The LED indicators 50, 52

and 54 are connected by lines 80, 82 and 84 respectively to an appropriate routing/processing circuit 86 which, in turn, is connected by cable 88 to computer 70 for control of the indicators. Obviously, the three cables  
5 72, 76 and 88 shown in Fig. 2 can be combined into a single cable connection between PC 70 and station 14.

Fig. 3 illustrates application of the mobile or portable fingerprint scanner and docking station of the present invention in a security system. In a typical  
10 security situation, a single scanner 12' is carried by the security officer and a docking station is located at each checkpoint or location where the officer is to perform an inspection.

In Fig. 3 the three locations identified #1, #2 and  
15 #3 represent checkpoints or location where the security guard is scheduled to inspect or contact during his inspection round. While three locations are shown in Fig. 3 by way of illustration, there can be any number of such locations. A docking station of the type shown  
20 in Fig. 1 is located at each location #1, #2 and #3 in Fig. 3. They are designated 14', 14" and 14" in Fig. 3. However, each docking station is a stand alone unit, not connected to a PC, and has its own power supply. A  
25 microprocessor is provided in each docking station and each station has its own unique identification number or code. The microprocessors are designated 100, 102 and 104 in Fig. 3. Each scanner is provided with a time of day clock, for example clock 110 in scanner 12', and bi-directional communication represented by arrows 112 in  
30 Fig. 3 is provided between each scanner and the docking station when the scanner is placed in the station.

When the security officer makes his round, when he reaches each of the locations #1, #2 and #3 shown in Fig. 3, he operates the scanner carried with him to scan

his fingerprint then inserts the scanner into the docking station at that location. The bi-directional communication between scanner and docking station provides a record of the time of day, the unique i.d. of the docking station and the fingerprint image of the security officer. This record can be stored in either or both of the scanner and docking station. Then, when the security officer completes the round, he inserts his scanner into the supervision base or docking station 120 which downloads the fingerprint images along with the times of day correlated with the docking station identification numbers to the PC 122 for further processing such as sending to a central monitoring station. As a result, control is provided on the security officer himself by way of the fingerprint imaging and his round by way of the times of day recorded against the docking station identifications. If desired, the docking stations can be connected together for direct transmission to the PC or other monitor as indicated by the broken lines 124, 126 and 128 in Fig. 3.

The principles of the arrangement of Fig. 3 can be applied to other situations, for example in monitoring the rounds of persons who inspect and service ATM machines. In all of the situations, the entire monitoring task can be accomplished using a single scanner in combination with a number of docking stations. Since the docking stations are relatively less expensive to manufacture this can result in economic advantages. In the application illustrated in Figs. 1 and 2, an entire fleet of law enforcement vehicles can be equipped with docking stations at relatively low cost and the fingerprint scanners can be acquired according to operational plans and budget.

It is therefore apparent that the present invention accomplishes its intended objectives. While embodiments of the present invention have been described in detail, that has been done for the purpose of  
5 illustration, not limitation.

The Claims

1. A fingerprint identification system comprising:
  - a) a portable fingerprint scanner which can be  
5 hand carried to various locations for obtaining fingerprint images and for storing the images obtained in the scanner; and
  - b) at least one docking station at a location  
10 spaced from the location where fingerprint images are obtained, the docking station being in the form of a receptacle for receiving the scanner, the fingerprint images being downloaded from the scanner when the scanner  
15 is received in the docking system.
2. A system according to claim 1, further including a computer operatively connected to the docking station for processing fingerprint images downloaded from the  
20 scanner.
3. A system according to claim 2, wherein diagnostic routines are provided by the computer for operation on the scanner while in the docking station.
- 25 4. A system according to claim 1, wherein the scanner is battery operated and wherein the docking station is provided with a voltage source for recharging the scanner battery when in the docking station.
- 30 5. A system according to claim 1, wherein the scanner is an ultrasonic fingerprint scanner.
6. A system according to claim 1, wherein the scanner has barcode scanning capability.

7. A system according to claim 1, wherein the docking station is located in a law enforcement vehicle and wherein the scanner is adapted to be carried by a law enforcement officer.

5

8. A system according to claim 7, wherein the scanner is provided with an external magnetic component for attachment to a vehicle during use in obtaining images.

10

9. A system according to claim 1, wherein the scanner has an infrared data link for wireless transmission of fingerprint images while received in the docking station.

15

10. A fingerprint identification and security system comprising:

20

a) a portable fingerprint scanner which can be carried on a person and which includes a time of day clock and a port for data communication to and from the scanner;

25

b) a plurality of docking stations at locations where inspections are to be performed, each of the docking stations being in the form of a receptacle for receiving the scanner, each docking station having a microprocessor and a unique code identification, there being bidirectional data communication between the docking station and the scanner received therein; and

30

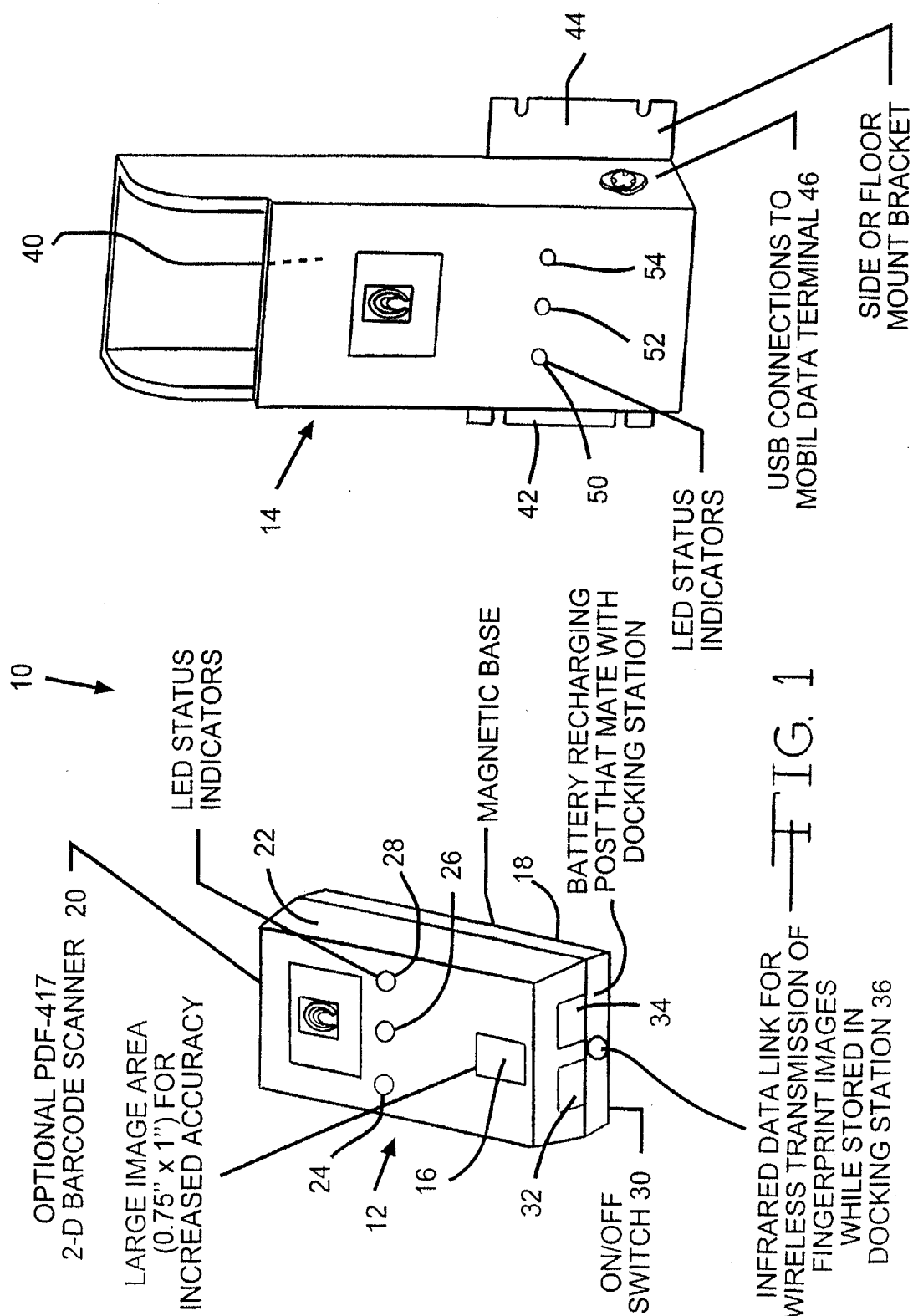
c) a supervisory docking station in the form of a receptacle for receiving the scanner for downloading fingerprint images, times of day and docking station identifications from the scanner received therein; and

d) whereby when a security person makes a round  
when he reaches each inspection location he  
operates the scanner to image his fingerprint  
and then inserts the scanner into the docking  
station at that location and a record is made  
of the time of day, unique identification of  
the docking station and fingerprint image of  
the security person which is stored in the  
scanner and then at the end of the round the  
security person inserts the scanner into the  
supervisory docking station which downloads  
the fingerprint images and times of day  
correlated with the docking station  
identification codes.

15

11. A system according to claim 10, further included a  
computer operatively associated with the supervisory  
docking station for processing the downloaded  
fingerprint images, times of day and docking station  
identification codes.

20



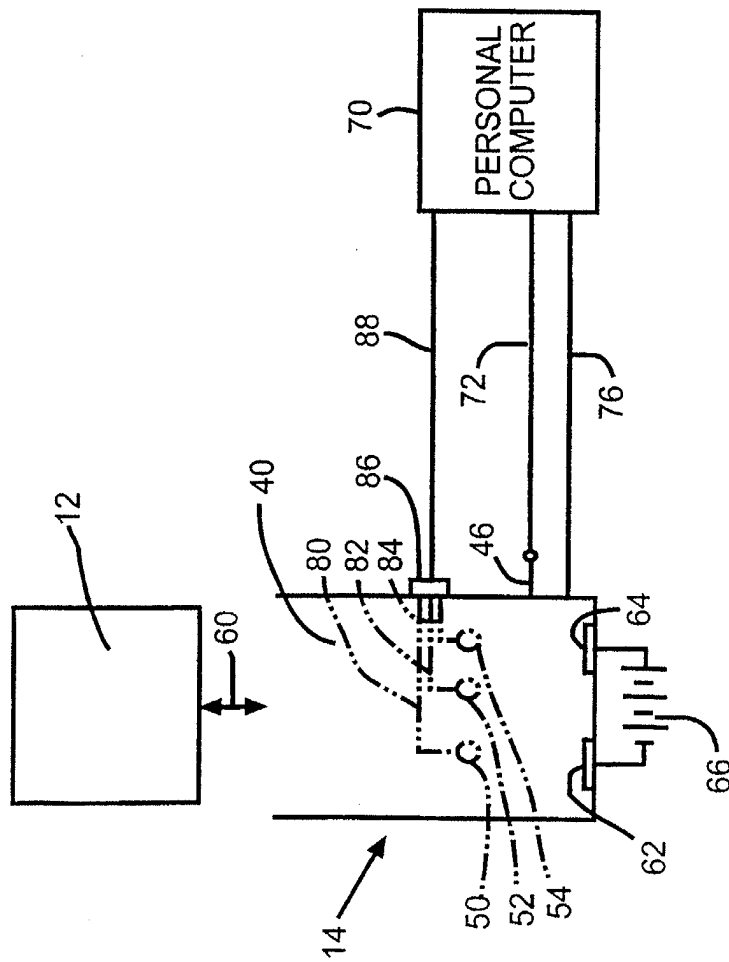


FIG. 2

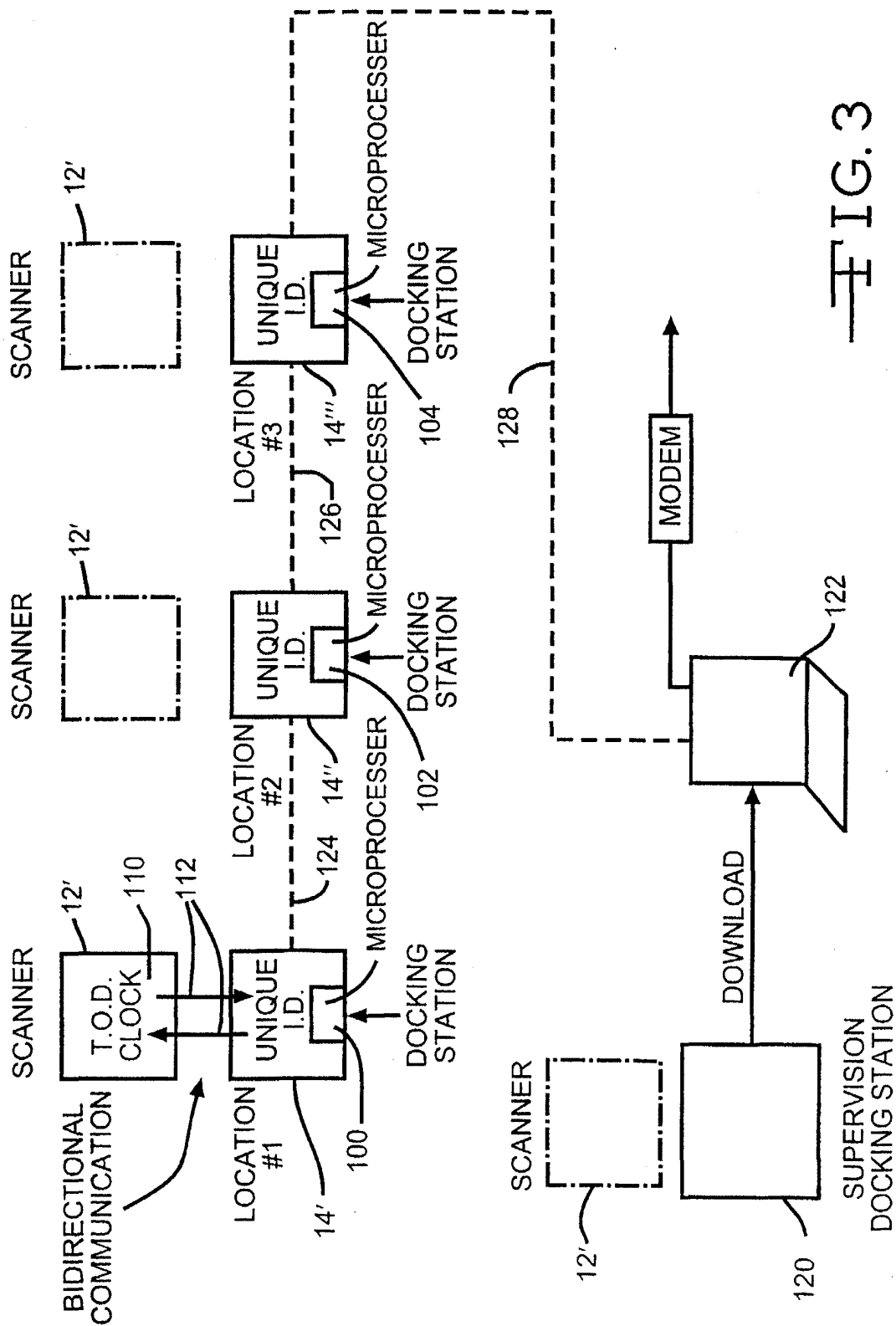


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.  
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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) :H04L 9/00; A61B 8/00; G06K 9/22, 5/00; G06F 11/30 US CL :Please See Extra Sheet. According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 382/115-116, 120-127, 312-315; 380/4, 9, 23, 25, 49-50; 128/660.09; 235/380; 395/186; 713/200 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,790,668 A (TOMKO) 04 AUGUST 1998, SEE FIGURES 1-5, COLUMNS 1-9.	1-11
Y	US 5,467,403 A (FISHBINE ET AL.) 14 NOVEMBER 1995, SEE TITLE, ABSTRACT, FIGURES 1-7, AND COLUMNS 1-2.	1, 10
Y	US 5,456,256 A (SCHNEIDER ET AL.) 10 OCTOBER 1995, SEE ABSTRACT, FIGURES 28-32, COLUMN 1, LINES 20-30,	5, 7-9
Y	US 5,878,211 A (DELAGRANGE ET AL.) 02 MARCH 1999, SEE ENTIRE OF REFERENCE	2-4, 6, 10-11
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER:  
US CL :

382/115-116, 120-127, 312-315; 380/4, 9, 23, 25, 49-50; 128/660.09; 235/380; 713/200